

In re Application of: SIRAT Gabriel et al
Serial No.: 10/542,865
Filed: January 10, 2006
Office Action Mailing Date: September 24, 2007

Examiner: Bryan J. Giglio
Group Art Unit: 2877
Attorney Docket: 30238

REMARKS

Reconsideration of the above-identified application in view of the amendments above and the remarks following is respectfully requested.

Claims 428-430, 432-440, 442-460 and 462-478 are in this Application. Claims 1-427 have been cancelled in a preliminary amendment filed concurrently with the present application. Claims 431, 441, 461, 473 and 474 have been cancelled herewith. Claims 428-477 have been rejected under. Claims 428, 442-443, 445, 448-450, 452, 460, 462-464, 472 and 476 have been amended. New claims 478 and 479 have been added.

Claim Objections

The Examiner objects to claim 462 stating that there is insufficient antecedent basis for the limitation "said at least one geometrical crystal filter." Claim 462 has been amended and the term "geometrical crystal filter" has been replaced with the term "birefringent crystal", now recited in independent claim 428 upon which claim 426 indirectly depends.

The Examiner objects to claim 464 stating that there is insufficient antecedent basis for the limitations "said low-resolution optical device" and "said low-resolution spectral range." Claim 464 has been amended to depend upon claim 460, thereby establishing sufficient antecedent basis to all limitations recited therein.

The Examiner objects to claim 465 as dependent upon previously objected claim. It is believed that the amendment to claim 464 overcome the objection to claim 465.

35 U.S.C. § 101 Rejection

The Examiner rejects claim 431 under 35 U.S.C. § 101 stating that the claimed recitation of a use, without setting forth any steps involved in the process, results in an improper definition of a process.

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Claim 431 is now cancelled thereby rendering moot the Examiner 101 rejection with respect thereto.

35 U.S.C. § 112 Rejection

The Examiner rejects claims 431, 460, 461, 464 and 465 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In regard to claim 431 the Examiner states that a claim is indefinite where it merely recites a use without any active, positive steps delimiting how this use is actually practiced.

Claim 431 is now cancelled thereby rendering moot the Examiner 112 rejection with respect thereto.

In regard to claims 460, 461, 464 and 465 the Examiner states that it is unclear and indefinite what is meant by the limitation "low-resolution optical device" and "low-resolution spectral range." The Examiner explains that the word "low" has only relative subjective value, and no previous limitations of the claims give "low-resolution" any context, such as an example of high resolution or normal resolution. The Examiner further states that it is unclear what resolution is meant to apply to, since there exist temporal, spectral and spatial resolution possibilities in typical optical systems.

The Examiner's rejection is respectfully traversed. Claims 460 and 464 have been amended, claim 461 has been cancelled and claim 465 depends from now amended claim 464.

Claim 460 as presently amended explicitly claim (that which has previous claimed implicitly) that the low-resolution optical device is characterized by a spectral resolution which is lower than a spectral resolution of the decoder. This amendment finds support, for example, in the passage bridging page 38 line 22

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and page 39 line 32 of the instant specification. Claim 464 has been amended to depend from claim 460.

It is submitted that since the term low-resolution is now recited in the context of providing spectral resolution which is lower than a spectral resolution of the decoder, amended claims 460, as well as claims 464 and 465 which are directly or indirectly depended upon claim 460, clearly point out the subject matter for which protection is sought.

Applicant respectfully disagrees with the Examiner's remark that it is unclear what resolution is meant to apply to, since the claim explicitly recites spectral resolution.

Claim 461 has been cancelled thereby rendering moot the Examiner 112 rejection with respect thereto.

35 U.S.C. § 102 Rejections - Funk et al.

The Examiner rejects claims 428-437, 439-445, 447-450, 452-465, 467-469 and 476 under 35 U.S.C. § 102(b), as being anticipated by Funk et al. The Examiner identifies in Funk et al. all the elements of claim 428, including the light deflector, the encoder and the decoder. Specifically, the Examiner identifies Funk's element 16 as the light deflector of claim 428, Funk's LCD mask as the encoder of claim 428, and Funk's elements 42, 46 and 48 as the decoder of claim 428. The Examiner also identifies in Funk et al. all the steps of method claim 476 including the deflection, encoding and decoding of the light.

Applicant respectfully traverses the rejection and states that the Examiner has not established a *prima facie* case of anticipation regarding the claims, since Funk et al. lack at least one limitation of the claims.

The following relates to independent claims 428 and 476. Dependent claims 429-430, 432-437, 439-440, 442-445, 447-450, 452-460, 462-465 and 467-469 are patentable at least by virtue of their dependency on their parent claims.

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Funk *et al.* disclose a Fourier transform spectrometer for obtaining a spectrum of a sample. Light from a polychromatic light source is dispersed into spectral components. A polarizer provides a polarization angle to the dispersed light, and a multiple-element polarizing device encodes each spectral component of the light with a different time-varying dependence of polarization rotation. A second polarizer generates a time-varying intensity for each spectral component. The intensity modulated and dispersed light is collimated into a single light beam which is thereafter split into a sample light beam and a reference light beam. The sample light beam passes through the sample. A Fourier transform is performed to both the beams to obtain a spectrum of the sample.

It is submitted that since Funk's spectrometer includes a light source, the wavelengths of the light exiting the source are already known. Thus, Funk *et al.* provide a technique for analyzing a sample rather than light. Since Funk *et al.* know the wavelengths of the light in advance their Fourier transform spectrometer does not determine the spectral components of the light because these components are already known. More specifically, each element of Funk's LCD mask is designated to a specific wavelength and is applied with a specific voltage for rotating the polarization of the light. However, as will be appreciated by the Examiner, this specific voltage can only be applied if the specific wavelength of the respective LCD element is known. To this end see Column 2 Lines 40-46 and Column 4 lines 35-40 of Funk *et al.*

The Examiner identifies elements 42, 46 and 48 of Funk *et al.* as the decoder which decoded the encoded light beam to determine at least one spectral component of the light. Applicant respectfully disagrees with the Examiner's interpretation from the following reasons.

Elements 42 and 46 are photomultiplier tubes which can only enhance light intensity and are certainly not operative to decode an encoded light (to this end see, e.g., Funk's Figure 2).

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Element 48 is a digital signal processor, which, according to the teachings of Funk *et al.* (see Column 4 Line 61 to column 5 Line 19), samples and records the waveforms resulting from the *i* elements. However, Funk *et al.* is silent regarding any use of the digital signal processor 48 for determining the spectral components of the light.

It is therefore submitted that the Examiner has not provided *prima facie* evidence that Funk's digital signal processor decodes the encoded light so as to determine at least one spectral component of the light.

Claims 428 and 476 as now amended require that the encoding is via at least one birefringent crystal. The amendment finds support, for example, in page 26 lines 1-4 of the specification as filed.

Applicant submits that this amendment is not substantive and it does no more then to draw attention to what was already part of the claims, because claim 441, now cancelled, states that the encoder comprises at least one geometrical crystal filter and the specification as filed describes a geometrical crystal filter as a crystal in which an incident light ray splits into an ordinary ray and the extraordinary ray, each propagating within the crystal at its own velocity and with a polarization defined by the crystal symmetry. Thus, this amendment is a cosmetic change of claim 441.

It is noted that Funk *et al.* do not disclose or imply encoding by a birefringent crystal.

It is therefore submitted that claims 428 and 476 are not anticipated nor are they rendered obvious by Funk *et al.* because Funk *et al.* do not disclose or imply (i) encoding by a birefringent crystal, and (ii) decoding the encoded light beam so as to determine at least one spectral component of the light.

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35 U.S.C. § 102 Rejections - Carey et al.

The Examiner rejects claim 472 under 35 U.S.C. § 102(e), as being anticipated by Carey et al. The Examiner identifies in Carey et al. the communications system of claim 472, including the de-multiplexing apparatus.

The Examiner rejection is respectfully traversed.

Claim 472 has now been amended to include the limitations that the encoder is capable of generating at least one angle-dependent polarization phase-shift in the deflected light beam, so as to provide an encoded light beam characterized by a plurality of angle-dependent polarization phase-shifts, and that the decoder determines the plurality of wavelengths of the optical signal based on the polarization phase-shifts. This amendment supported thought the instant application, see et al., claim 439, and pages 26-27 of the specification as filed.

Carey et al. discloses a technique for multiplexing individually modulated components of light from a broad-spectrum light source. An optical divider divides the light into plural carrier beams, and a multi-channel modulator modulates each carrier beam responsive to a respective data signal to yield a respective frequency modulated beam. An optical combiner multiplexes the encoded beams and injects the multiplexed signal into a communication medium for reception elsewhere. The decoding is done by converting the frequency modulation to intensity modulation.

The principle of operation of Carey's system is substantially different from the principle of operation of the communication system defined in claim 472. Carey et al. employ a plurality of optical modulators (elements 34, 34a, etc.), each of which having an individual filter frequency and being individually configured to implement frequency modulation of a portion of the optical signal for encoding data thereon. Carey et al. provide an example in which the modulators are configured as Fabry-Perot cavities tuned to respective passbands and being configured to modulate desired portions of the optical signal having the respective

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wavelengths (Column 5 Lines 45-50). The birefringent materials in the modulators are electrically controllable and serve for selecting the appropriate passbands.

In the communication system of claim 472, on the other hand, the encoder generates a polarization phase-shift which is then used for determining the wavelengths of the optical signal.

It is submitted that Carey *et al.* are silent with respect to any generation of polarization phase-shifts and determination of the wavelengths based on the polarization phase-shifts. It is further submitted that the conversion of frequency modulation to intensity modulation, as taught by Carey *et al.*, cannot be considered as functionally equivalent to the determination of the wavelengths based on the polarization phase-shifts, because these are completely different optical operations.

Thus, claim 472 is not anticipated nor rendered obvious by Carey *et al.*

35 U.S.C. § 102 Rejections - Trisnadi et al.

The Examiner rejects claims 473 and 474 under 35 U.S.C. § 102(e), as being anticipated by Trisnadi *et al.*

Claims 473 and 474 is now cancelled without prejudice thereby rendering moot the Examiner's rejection with respect thereto.

35 U.S.C. § 103 Rejection

The Examiner rejects claims 466 under 35 U.S.C. § 103(a), as being unpatentable over Funk *et al.*, in view of Official Notice of well known practice in the art. The Examiner acknowledges that Funk *et al.* are silent to apparatus characterized by a sub-picometer resolution, but states that Funk *et al.* teaches that a plurality of dispersive optics may be used in series to increase resolution as small as 20 picometers.

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The Examiner takes Official Notice that it would have been obvious to try to obtain higher resolution than 20 picometers using the exact same process of multiple elements, in order to permit expansion of a limited wavelength range over an LC mask surface.

Applicant hereby traverses the Examiner Official Notice of well known practice, and states that it would not be obvious to obtain sub-picometer resolution from the 20 picometers resolution taught by Funk *et al.*, because such enhancement spans over more than an order of magnitude. An increment by more than an order of magnitude involves many optical considerations other than a simple alignment of multiple elements, as suggested by the Examiner.

It is therefore submitted that claim 466 is patentable over Funk *et al.*

Allowable Subject Matter

The Examiner has pointed out that claims 470, 471, 475 and 477 are allowed.

The Examiner further pointed out that Claims 438, 446 and 451 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

New Claims

New claim 478 is directed to a method of sensing changes in environmental conditions affecting a wavelength of light, comprising executing the method of claim 476 for determining wavelength changes in the light, thereby sensing the changes in environmental conditions. The subject matter of claim 478 finds support in claim 431, now cancelled. It is submitted that method claim 478 is patentable at least by virtue of its dependency on claim 476.

New claim 479 includes all the limitations of previously presented claims 428, 437 and 438. In view of the Examiner's statement on page 13 of the instant action, new claim 479 is allowable.

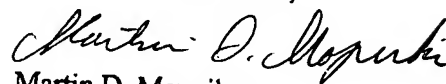
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In view of the above amendments and remarks it is respectfully submitted that the claims are now in condition for allowance. A prompt notice of allowance is respectfully and earnestly solicited.

Respectfully submitted,



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Encls:

- Petition for Extension (2 months)
- Additional Claim Transmittal